

Temporal and Spatial Gradients In Dissolved Oxygen Concentrations Assessment Techniques

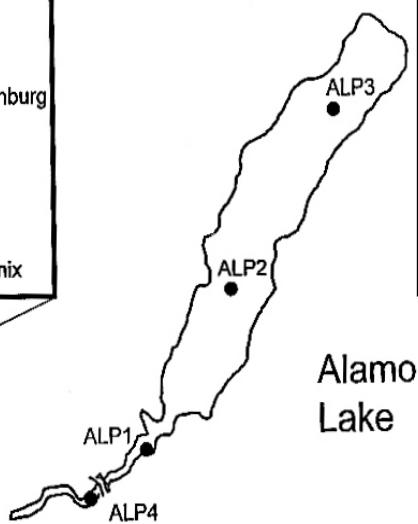
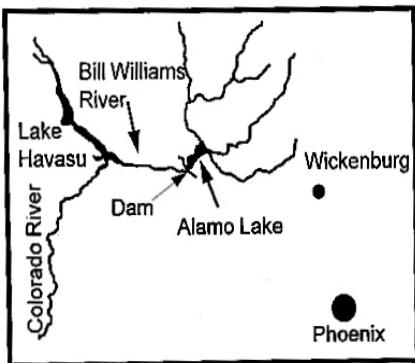
**Steve Ashby, PhD
USACE Research and Development Center
Waterways Experiment Station**

(601) 634-2387

Steven.L.Ashby@erdc.usace.army.mil

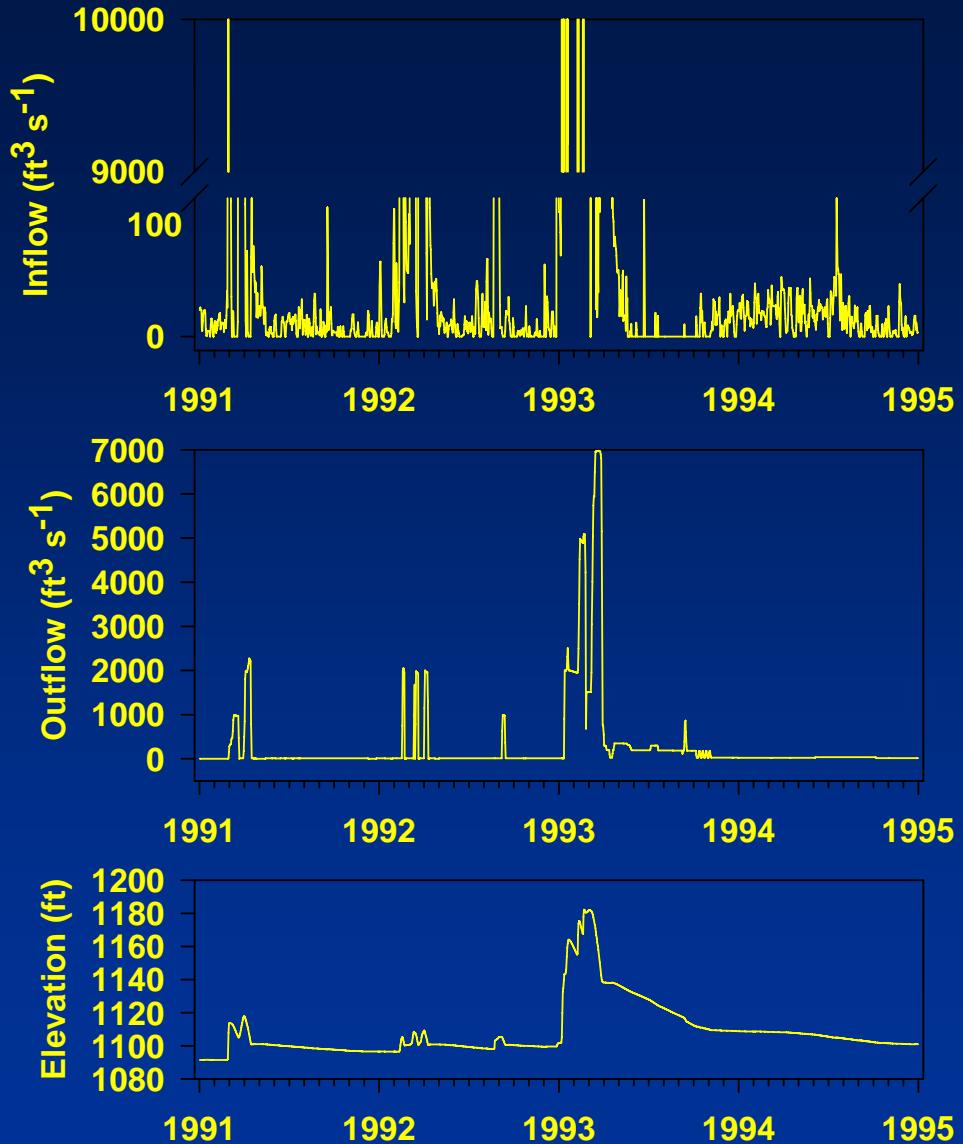
Alamo Lake, AZ

Case Study: Flood Control Project in Arid Region



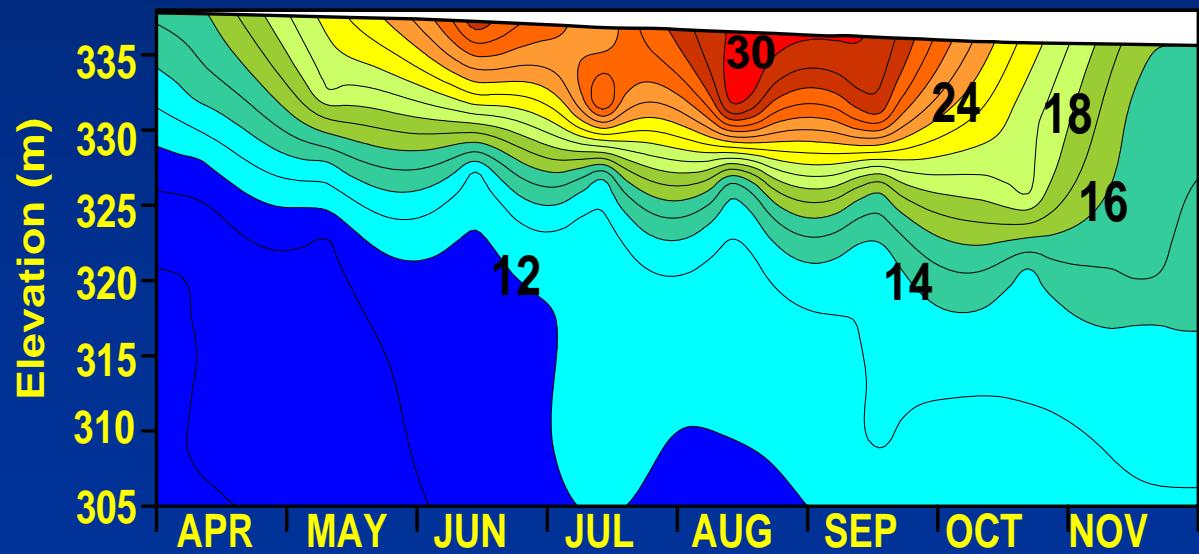
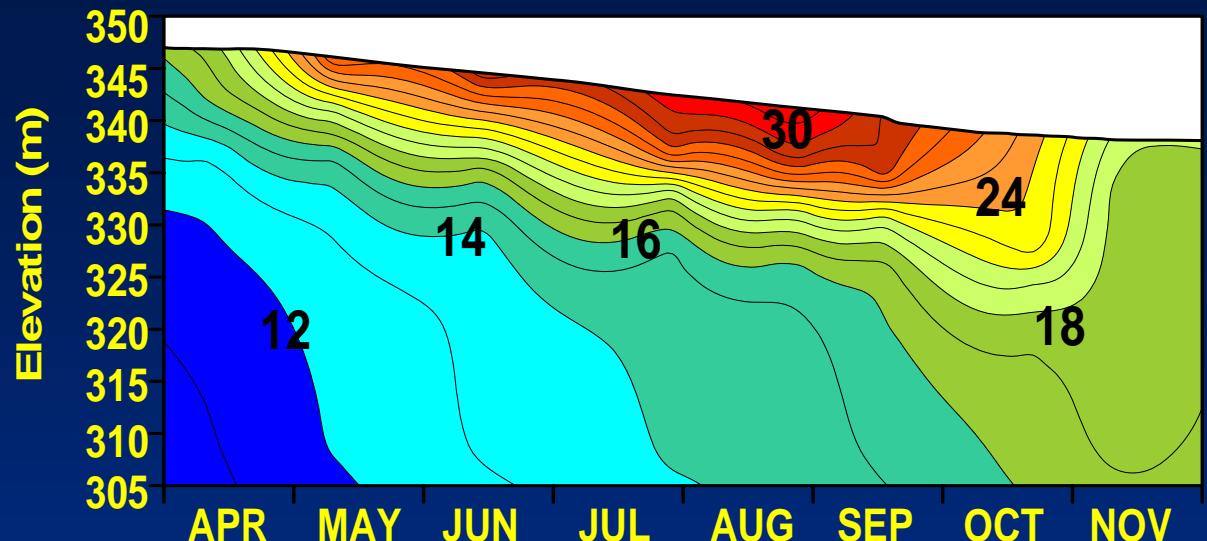
Hydrologic Information

- 1993 was a very wet year with high surface elevation and discharge
- 1994 was a very dry year with low discharge



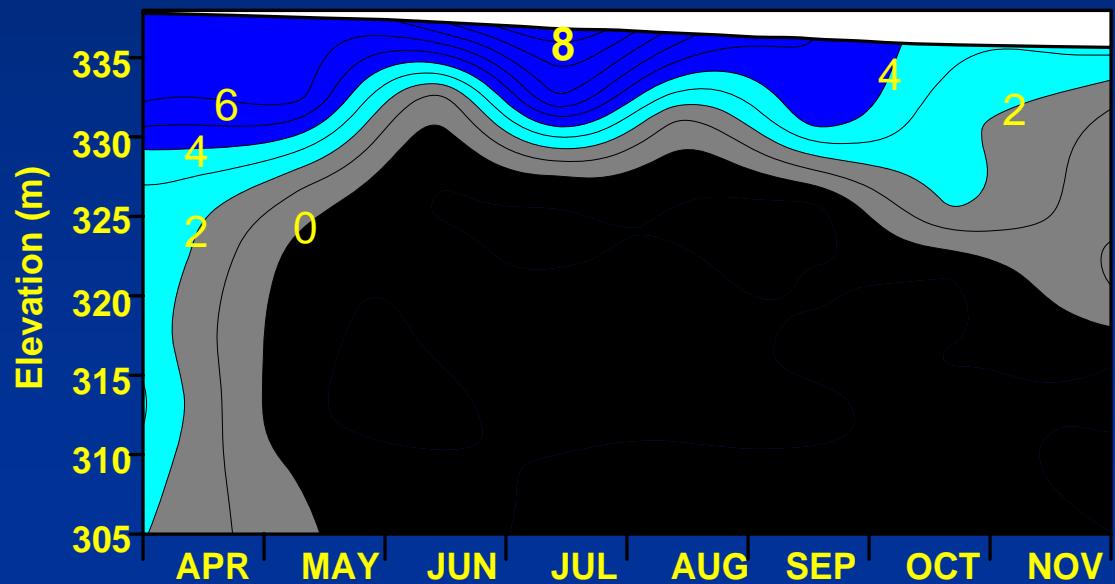
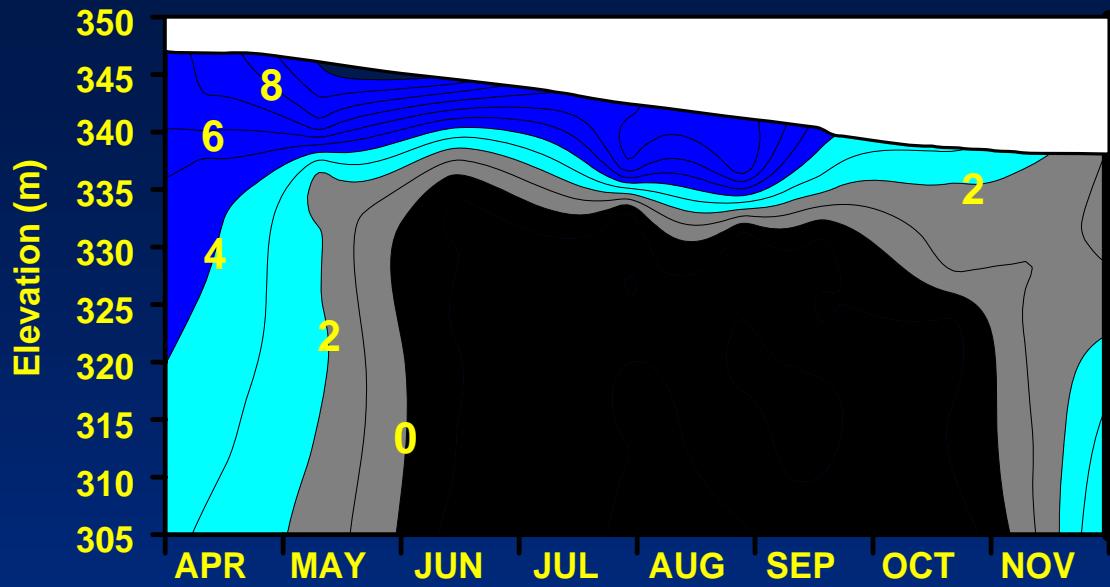
Thermal Structure

- 1993 (top)
- 1994 (bottom)

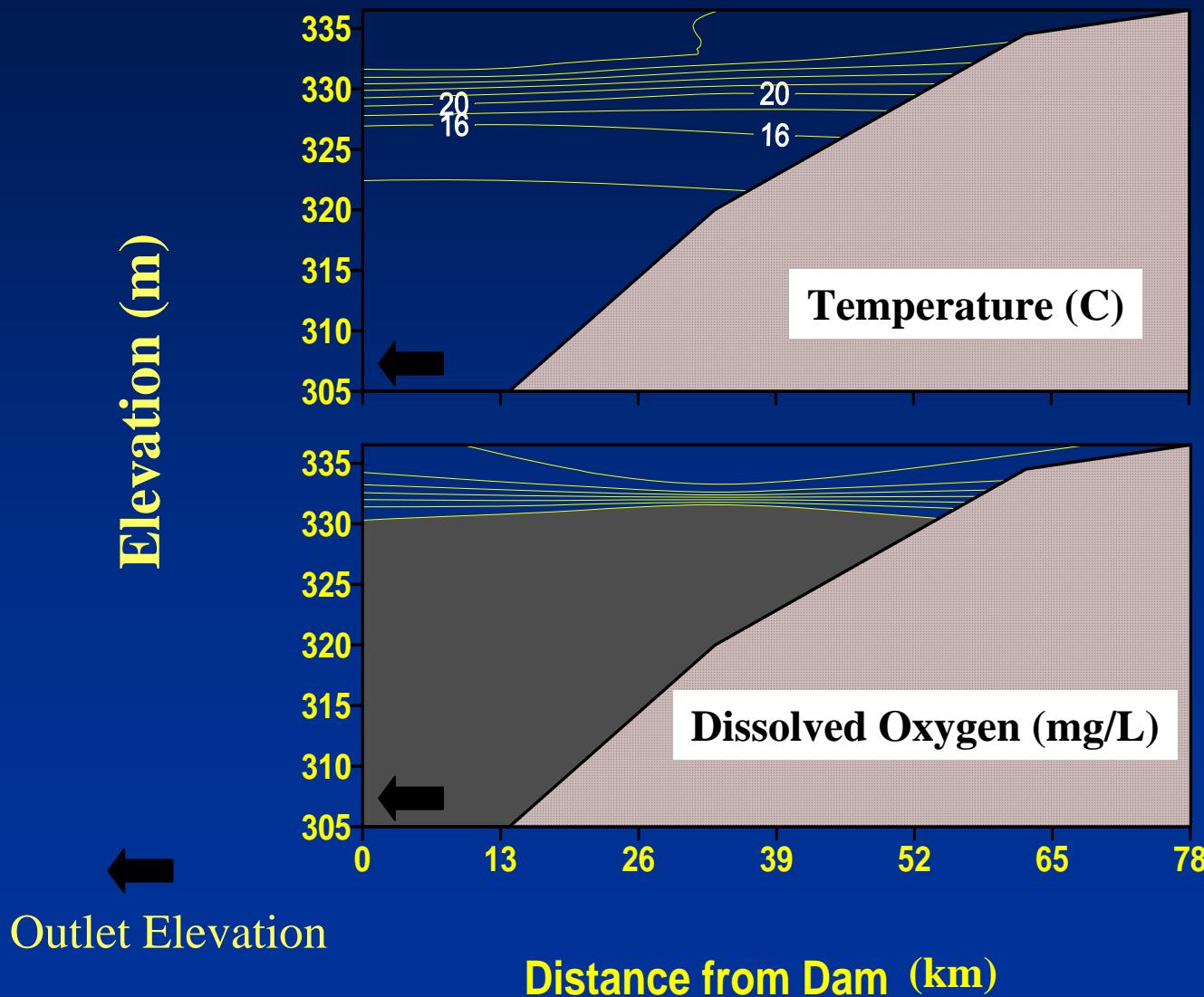


Dissolved Oxygen Distribution

- 1993 (top)
- 1994 (bottom)



Longitudinal Gradients - Late Summer



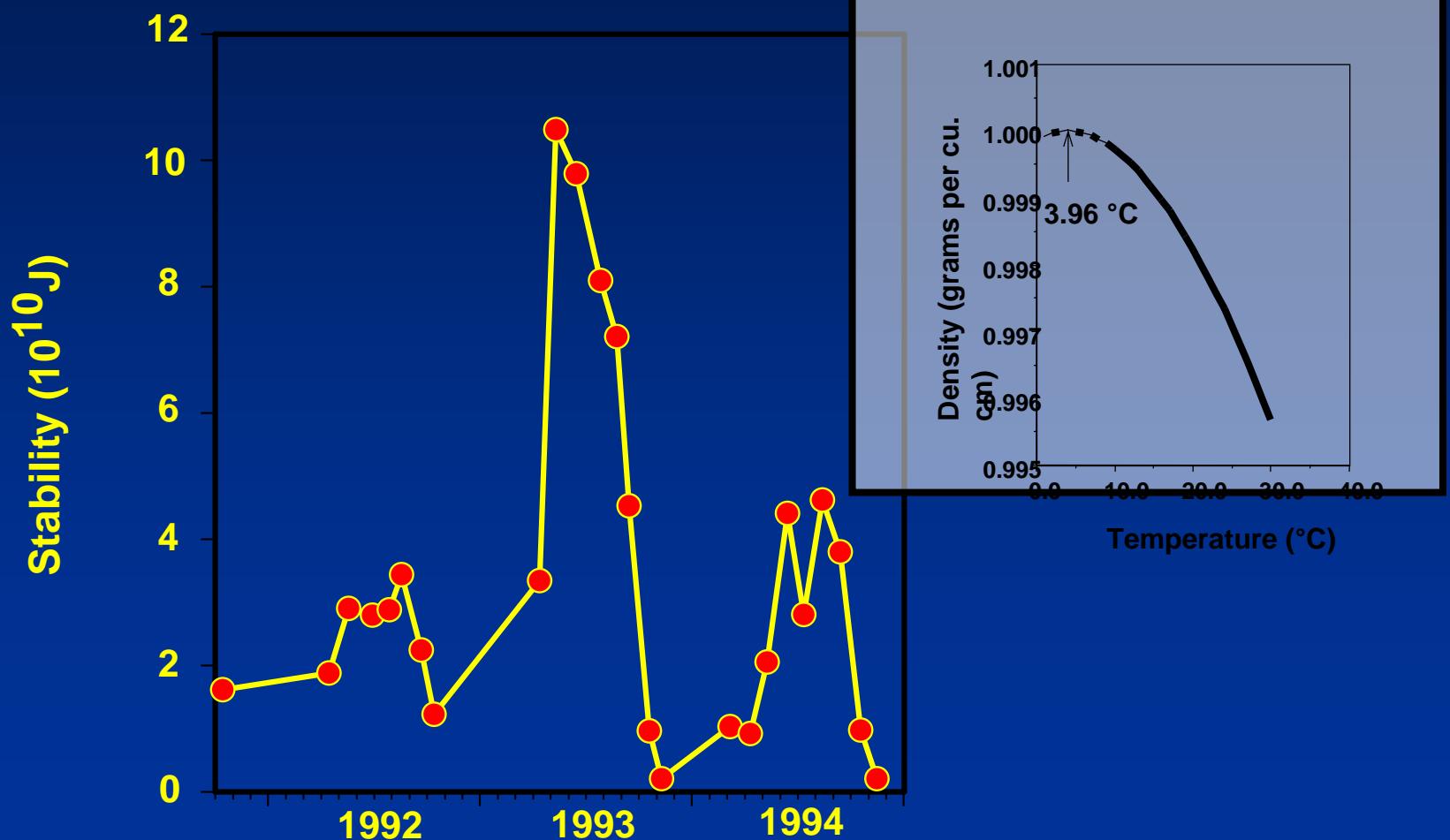
Stability

Stability (J) = $PEM - PES$

$$PE = g \sum_{i=1}^n p_i V_i h_i$$

Davis, J.M. 1980. Water Services, 84, 497-504.
Meyer, E.B. 1991. IEB, E-91-1, USAE, WES
Hutchinson, G.E. 1957 and Birge, E.A. 1915

Stability

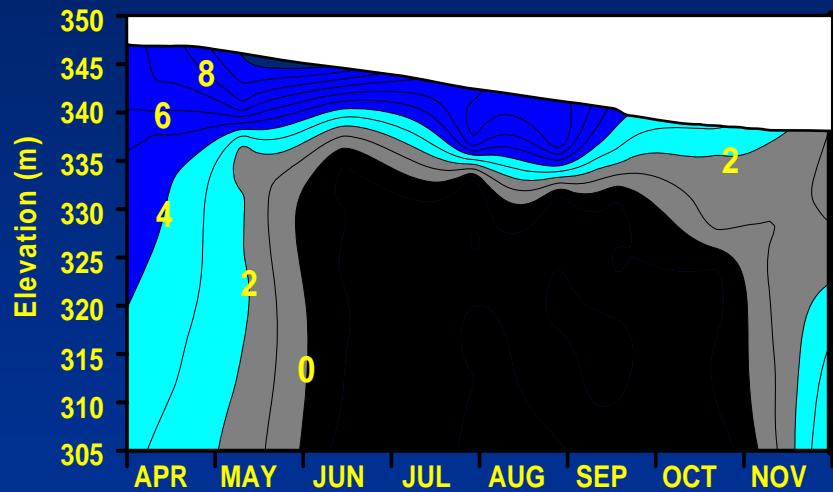
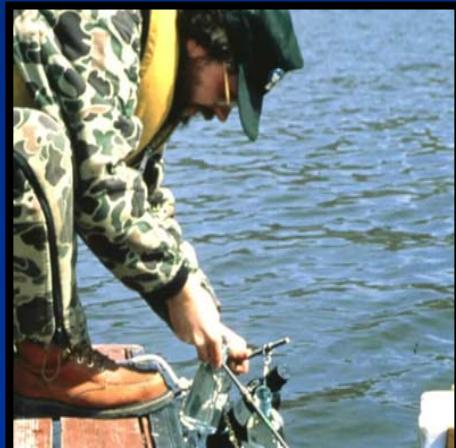


Dissolved Oxygen Dynamics

- Hypolimnetic Oxygen Deficit Rates

Walker, W.W., 1987. TR EL-81-9, USAE

PROFILE



- Oxygen Consumption Rates
Dark Bottle Respiration
Measurement

PROFILE

**Areal or Volumetric Rates
Valid for Oxic Conditions**

**Requires Morphometry,
Area/Volume Curves**

Bottle Method

**Discrete Rate
Applicable to Oxic
or Anoxic Conditions
Requires Multiple
Sampling Depths**

Dissolved Oxygen Consumption

PROFILE

0.04 - 0.11 mg L⁻¹ day⁻¹

**Oxygen Consumption
Method**

0.05 - 0.51 mg L⁻¹ day⁻¹

Recommended

0.15 mg L⁻¹ day⁻¹

Recommendations

Alternate Low Level Release



Aeration System

